APPENDIX A

Department of Energy
Washington, DC 20585

NOV 17 1994

Professor Stanley Wojcicki
Department of Physics
Stanford University
Stanford, California 94305

Dear Professor Wojcicki:

I would like to request that the High Energy Physics Advisory Panel form a composite subpanel for the assessment of the status of accelerator physics and technology. In addition to HEPAP, the subpanel should draw its membership from, or through, the other four ER advisory committees; i.e., the Basic Energy Sciences Advisory Committee, Fusion Energy Advisory Committee, Health and Environmental Research Advisory Committee, and Nuclear Science Advisory Committee. The charge for this subpanel is contained in the enclosed document.

The subpanel report should be completed, reviewed by HEPAP, and transmitted to DOE no later than August 1, 1995.

Thank you for your assistance in this important matter.

Sincerely,

Martha A. Krebs
Director
Office of Energy Research

Charge for the
Composite Subpanel for the Assessment of the Status of
Accelerator Physics and Technology

I. Introduction

Particle accelerators have become central to many areas of modern science and technology. They have always defined the frontiers of particle and nuclear physics and are now beginning to play the same role for important parts of materials sciences, chemistry, biology and medicine. Because of these strong scientific roles, applications of accelerators are also expanding into industry, medical treatment, and defense. It is very likely that trends toward greater use in science and wider applications in industry and other areas will continue, and that farther in the future, particle accelerators will play an ever-increasing role in addressing some pressing societal needs, among them the safe production of electrical power and restoration of the environment, applications only dimly envisioned today.

Accelerator physics and engineering address the means by which particle beams are produced, and how these beams can be tailored for application in scientific research, industry, medicine, and defense. Accelerator science evolved from early studies in nuclear physics, where the design and construction of early particle beam devices were an integral part of the research, to the very complex applications of modern high energy, high current accelerators in particle physics, nuclear physics and materials sciences on the one hand, and sophisticated but inexpensive mass-produced instruments with numerous applications in industry and medicine on the other. To design and build a modern accelerator or colliding beam facility requires a multidisciplinary amalgam of classical physics (mechanics, electricity and magnetism, and thermodynamics) and advanced engineering (civil, structural, vacuum, radiofrequency, cryogenic and magnetics). The result has been a rich development of technologies, some very unique to accelerator building and some--for example, superconducting magnets--with wide spin-off benefits. Several years ago, the American Physical Society (APS) gave formal recognition to accelerator physics as an emerging, intellectual discipline in its own right by the formation of the Division of Physics of Beams (DPB). This follows a historical tradition set with the much earlier establishment of the Optical Society of America and the American Vacuum Society. The DPB gives recognition to the maturity and sophistication of accelerator physics (and engineering) and the importance of this technology to physics, in particular, and science, in general.

Accelerators have been an important element in the Department of Energy (DOE), Office of Energy Research (ER) programs for many years, as they were in similar basic research programs in the two predecessor agencies, the Atomic Energy Commission and the Energy Research and Development Administration. In fact, much of the development of modern accelerator physics and technology was carried out under the auspices of these earlier agencies. Accelerator Physics and Technology is today a core competency of the DOE Office of Energy Research. The use of accelerators, storage rings, and colliding beam facilities as diverse and flexible sources of radiation and particle beams for scientific research are important for all ER programs. Although the principal R&D activity in accelerator physics and technology has been, historically, supported through the ER Division of High Energy Physics, Technology R&D Branch, there are accelerator R&D programs tailored to specific objectives in Nuclear Physics, Basic Energy Sciences, and Fusion Energy. There are also strong research needs for accelerators in the sciences and applications supported by the Office of Health and Environmental Research. Recently, representatives from the Division of Physics of Beams proposed to DOE that the Division conduct, through the National Academy of Sciences (NAS), a national

assessment of beam physics as a scientific field in the U.S.: its history; current status; contributions to applications in industry, medicine, and defense; the future promise to basic science and for new practical applications; and the funding health. Although, DOE decided not to fund the DPB/NAS study, many of the issues and questions raised in the proposal are important to the future of ER programs; in particular, the need to look at this important core competency in a unified way, integrated across all five ER programs.

II. Formation of a Composite Subpanel under HEPAP

An integrated assessment of the ER activities in accelerator physics and technology requires input from all the ER-supported scientific communities. For this reason, ER believes a Composite Subpanel for the Assessment of the Status of Accelerator Physics and Technology should be established. Although formed under the High Energy Physics Advisory Panel (HEPAP), the Subpanel also draws membership from, or through, the other four ER Advisory Committees: Basic Energy Sciences Advisory Committee (BESAC), Fusion Energy Advisory Committee (FEAC), Health and Environmental Research Advisory Committee (HERAC), and Nuclear Science Advisory Committee (NSAC). The Composite Subpanel will receive staff support from all five of the involved ER program offices as required.

III. Charge to the Subpanel

The Director of the Office of Energy Research requests that the subpanel carry out a broad assessment of the current status and promise of the field of accelerator physics and technology with respect to all five ER programs--High Energy Physics, Nuclear Physics, Basic Energy Sciences, Fusion Energy, and Health and Environmental Research--and provide recommendations and guidance to the Director on appropriate future research and development needs, management issues, and funding requirements. The committee should exercise wide latitude in carrying out the study, but the following issues and questions should be addressed:

1. **Review and summarize the role that accelerators, storage rings and colliding beam devices play in the ER research programs, providing also a brief summary of the R&D carried out within each program to support accelerator, storage ring and colliding beam facility operations; for the improvement of existing facilities; and for the development of new facilities.**

2. **Provide an assessment of spinoffs and applications from the ER accelerator R&D activities with a focus on contributions to the productivity and competitiveness of American science, industry, and medicine in a world economy.**

3. **Determine if the level of R&D for each ER program is appropriate, in terms of R&D content, activity level, and funding, to ensure the success of the scientific goals of that program and to assess future opportunities to meet national needs through accelerator science.**

4. **Examine the approach used by the five individual ER program offices in managing their R&D activities in accelerator physics and technology to determine if each is appropriate to the overall needs of that program.**

We request that the subpanel complete its study and provide its assessment and recommendations to the Director of the Office of Energy Research by August 1, 1995.